REMARKS

This preliminary amendment is submitted in connection with a continuing patent application following final rejection of all of pending claims 1-24 in the parent application (which bore serial no. 09/211,614). The previous Examiner's Actions had rejected all claims as obvious over two references and in some cases a third. None of the claims had been rejected as anticipated.

1. The Amendments

Applicants have withdrawn pending claims 1 – 24 and presented newly pending claims 25-80 in an effort to present claims more in accordance with Patent Office and English language style and syntax. Additionally, applicants have amended the specification in a clerical way to replace the word "course" and the word "margin" with the word "pattern", so that meaning is clearer in the context of concepts such as intensity and diffraction patterns. Applicants have also and similarly changed the word "borders" to "edges" for clarity.

2. Summary of Remarks

The newly presented claims (which are all process claims and which include four independent claims, 25, 43, 49 and 63) all address and define measuring a dimension of an article by illuminating a portion of the article with a beam of light in a way that, unlike the cited references, takes advantage of diffraction patterns from light assumed to have a non-planar (or fan-shaped) wavefront. According to all newly pending claims, information from the array is evaluated according to Fresnel diffraction theory, and according to the assumption that the wavefront from the light

source is nonplanar, to determine the dimension. As discussed below and in the application at the places cited below, applicants' resulting measuring device, even if it involves mathematical analysis of a different and higher degree of complexity than analysis of intensity patterns caused by parallel light, can fit in the palm of the hand, yet serve as an accurate and reliable instrument for uses such as measuring wire that is being manufactured.

Furthermore, each of the four independent claims adds additional limitations to the inventions claimed therein. Independent claim 25 adds that distances between the source, article and array are selected such that the intensity pattern in the vicinity of one shadow edge cast by the article on the array is at most negligibly superimposed on the intensity pattern in the vicinity of the other shadow edge cast by the article on the array. Claim 43 adds that limitation and, among others, that determination of the dimension of the article includes compensating for the difference between (i) the dimension of the article that casts the intensity pattern; and (ii) the diameter of the article. Claim 49 requires at least two sources and two sensors. Claim 63 adds the limitation that signals from the sensors corresponding to light intensity in the intensity pattern in order to attenuate effects of dirt. (Cites to portions of the application which disclose these limitations are listed in Section 4 of this Remarks Section.) Clearly, measuring processes having these limitations are not disclosed or suggested in the references cited in this application.

As discussed below, the French reference discusses a geometrical approach that treats light as a ray phenomenon. The French reference discloses using a so-

called fan-shaped beam of light to create a shadow on an light sensor, but determination of the measurement occurs using geometry or ray principles rather than analysis of diffraction patterns. The Ring patent specifically and expressly rejects that approach, because among other things, the French reference geometrical or ray approach requires a highly accurate, and thus not readily available, light sensor and because it relies so heavily on accurate spacing of the workpiece from the sensor. Ring seeks to escape the geometrical or ray approach by using a large and complex structure with multiple sensors and lenses to create and analyze diffraction patterns from parallel light. Size and complexity may not matter, since the Ring system is shown to measure workpiece dimensions in connection with a lathe-type device. Ring only discloses evaluation of diffraction patterns formed by parallel light, or light having a planar wavefront, a simpler mathematical case than in applicants' invention. Whether that is because Ring was filed circa 1985 before processing power of the sort required by applicants' invention was readily available, or because the Ring measurement device is disclosed as being used on a lathe-like device to measure apparently sizeable dimensions of a workpiece, what is clear is Ring does not teach or suggest the compact, reliable, accurate device made available by applicants' invention.

In fact, as mentioned above, the text of Ring expressly teaches away from combining its parallel light approach with the geometrical techniques such as in the French reference. In any event, there is nothing in either Ring or the French reference that would teach, suggest or incentivize combination of them. Applicants

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accordingly below respectfully submit that there is not a prima facie obviousness case as required here, and they respectfully request such a position be reconsidered and withdrawn.

3. The References

The two primary obviousness references that formed the basis for previous obviousness rejections were: (1) U.S. Patent No. 4,854,707 issued August 8, 1989 to *Ring et al* entitled "Method and Apparatus for the Optical Electronic Measurement of a Workpiece" ("Ring patent"); and French publication No. 2,371,673 published June 16, 1978 corresponding to French patent application no. 76 35004 filed November 19, 1976 in the name of "Societe Industrielle De Liaisons Electriques - Silec (the "French reference").

a. French Reference

The June 5, 2001 Examiner's Action recognizes that the French reference shows measuring diameter of an article by placing it in a fan-shaped beam of light and determining where the edges of the resulting shadow are located relative to certain detectors. The Action recognizes that the French document does not appear to teach using diffraction patterns to accomplish this measurement. The Action takes the position, however, that such use of a diffraction pattern is known in the art as shown by *Ring*. Accordingly, it would have been obvious, says the Action, to use such diffraction pattern techniques in the device of the French reference. June 5, 2001 Examiner's Action page 2.

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Applicants concur with the Action's position regarding the French reference, and in particular agree that while the French reference discloses measurement of the diameter of an elongated article using a fan shaped beam, but not by analyzing a diffraction pattern. Rather, the French reference discloses measuring the distance between edges of shadows caused by the article, and doing so in a geometric fashion assuming that light is purely a ray phenomenon. The French reference was filed in 1976, before the age of personal computers. There is nothing in the French reference that suggests analysis of a diffraction pattern to measure the diameter of the article, perhaps because the French reference was on file before reasonably priced and available computer technology was available to perform such analysis efficiently and effectively, at a reasonable price point.

b. The Ring Patent

The June 5, 2001 Action says that Ring teaches using the diffraction pattern resulting from the passage of light over the edge of an object to improve the measurement. June 5, 2001 Examiner's Action page 2.

Applicants agree that the Ring patent discloses analysis of diffraction patterns to measure dimensions of a work piece. However, no drawing and no text of Ring discloses other than using a source of parallel light to create the diffraction pattern. At Ring, column 3, lines 15-17, by contrast, it is made clear that the radiation is directed parallel. Figures 1 and 6 of Ring make that point distinctly. Figure 1 shows only parallel light rays. There is no drawing or text showing a non-parallel light case.

Ring figure 6 is consonant with the first sentence of the patent which says that the optical electronic method it discloses is for measuring a "work piece." Figure 6 shows a device resembling a lathe, and the light source 3, combined with lens system 7, is a sizeable structure occupying a considerable part of one side of a "sled 22." The sled, which carries the light sources 3 and the lens system 7, is discussed at column 4 lines 26-44. The sled rides on guide rails 21 so that light sensors, light sources and lens can be positioned as desired relative to the work piece. Id.

The Ring apparatus goes to considerable structural effort to illuminate the work piece with parallel light. Ring embraces structural complexity, with multiple lenses and sensors, to create the parallel light diffraction patterns in its quest to escape the geometrical or ray approach as taught in the French reference. For instance, Ring discusses the need to address aberration effects in the lenses (Ring, column 3, lines 18-21). In any event, Ring fails to disclose or suggest use of any other than a complex structure with multiple lenses and sensors for creating and analyzing a source of parallel light diffraction patterns.

4. Applicants' Invention

Processes of the invention of the present application and the currently pending newly presented claims do not categorically reject the geometrical or ray based approach of the French reference as Ring does, and are therefore not forced to a embrace a large and structurally complex system that requires a number of lenses and sensors like Ring does. Instead, processes of the present invention reconcile the geometrical or ray approach with the wave phenomenon approach, by

using an essentially point source of light in a small and structurally simple system that is based on analyzing a diffraction pattern assuming light with a non-planar wave front. Application page 3, lines 4-5; page 10, lines 11-16; page 10, lines 27-28; Figures 1, 4, 5, 6, 7, 9, 11, 12. The diffraction pattern on the array is analyzed according to Fresnel diffraction theory, a theory that takes into account the non-planar wave front from the point source. Application page 3, line 18 -- page 4, line 15. Because a parallel light source is not required, the light source can be a point source such as a laser diode. Application page 10, lines 11-12. Lenses are not required and if used they can be less complex than in systems which seek to produce parallel light rays. Application page 5, line 21-page 6, line 2. As the attached declaration of inventor Dr. Blohm shows, the use of Fresnel theory to analyze intensity patterns from light assumed to have a nonplanar wavefront now makes it possible to provide a measuring device that can fit in the palm of the hand. That declaration attaches a copy of a sales brochure for the "Inline 2000" Laser 2010XY/Laser 2025XY gauge heads marketed by applicants' company, Sikora Industrieelektronik GmbH.

Furthermore, each of the four independent claims presented above adds additional limitations to the invention claimed therein. Independent claim 25 adds that distances between the source, article and array are selected such that the intensity pattern in the vicinity of one shadow edge cast by the article on the array is at most negligibly superimposed on the intensity pattern in the vicinity of the other shadow edge cast by the article on the array. (Application p. 5, lines 16 –19) Claim

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45 adds that limitation and, among others, that determination of the dimension of the article includes compensating for the difference between (i) the dimension of the article that casts the intensity pattern; and (ii) the diameter of the article. (Application p. 4, line 22 – p. 5, line 2) Claim 51 requires at least two sources and two sensors. (Application fig. 4; p. 12, line 19 – p. 13, line 7) Claim 65 adds the limitation that signals from the sensors corresponding to light intensity in the intensity pattern in order to attenuate effects of dirt. (Application, p. 6, line 20 – p. 7, line 7; p. 12, lines 1 – 10). Quite clearly, none of the inventions claimed in independent claims 25, 43, 49 or 63, with these limitations, are disclosed or suggested in the references cited in this application.

5. No Obviousness Case

Even though the French reference discloses using geometrical techniques to analyze the shadow of an article in a fan-shaped beam of light, and even though Ring shows going to considerable length to create and analyze diffraction patterns using parallel rays of light, nothing in either of them shows any grasp or hint of the notion that diffraction patterns should be created and analyzed using processes that only require small and structurally simple systems that assume the light to be a non-planar wave front light phenomenon to measure dimensions of an article. As discussed above, Ring discloses an elaborate structure intended to produce parallel light, and is thus inherently antithetical to the notion of using a small light source to create the more complex non-planar wavefront of light. In any event, there is simply no text from which an inference can be permissibly drawn, much less any express

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discussion that would provide incentive, suggestion or teaching to combine the Ring diffraction pattern analysis techniques with the French reference geometrical technique.

In fact, ***Ring teaches away*** from combining the French reference geometrical or light ray-based measuring technique with diffraction pattern measuring techniques. Column 1, lines 15-28 of Ring specifically recognizes the existence of prior art optical electronic measuring methods which utilize the shadow produced by a work piece, such as in the French reference. It recognizes that these prior art measuring methods, such as the French reference, use geometrical (ray) optics as opposed to wave optics. Ring, Column 1, lines 22-23; column 1, lines 26 – 34 and column 2, lines 21 - 25. But instead of seeking to improve on such techniques, Ring rejects them: Among other reasons, Ring says that such geometrical (ray) methods often require that precise distances be maintained between the light source, the work piece and the sensor so as to avoid an unfavorable effect on precision if the distances cannot be maintained. It also says at column 1, lines 38-46, that such prior art geometrical (ray) techniques as in the French reference require the light sensors to have a high capacity of resolution. Ring notes that apart from unavailability of such sensors in many cases, seeking to compensate mathematically using purely geometrical (ray)techniques, as in the French reference, detracts from reliability of the measuring results. Id. Accordingly, Ring places the French reference type geometrical (ray) optic solution in a separate category from its own wave optic solution and rejects the geometric (ray) optic

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solution rather than combining such geometrical (ray) optic techniques with wave optic techniques. *Ring* Column 1, line 18-46.

Cases are legion that absence of any suggestion to combine references, as here, is fatal to an obviousness determination. *Northern Telecom, Inc. v. Data Point Corp.*, 908 F.2d 931, 934 (Fed. Cir. 1990) (affirming district court holding that claims had not been proved invalid as obvious and holding that the patent challenger must present evidence of some teaching, suggestion or incentive supporting a combination of references). Beyond that, and without belaboring this document with a plethora of citations, it is clear that references which teach away from one another only strengthen the nonobviousness case. Accordingly, the Actions to date have failed to establish a prima facia case that the pending claims are obvious.

CONCLUSION

Applicants are confident that pending claims 25-80, which all claim processes that, unlike the prior art, reconcile geometrical (ray) approaches with treating light as a wave phenomenon and thereby require analysis of diffraction patterns assuming light with a non-planar wave front and other limitations as discussed above, are

novel, unobvious and otherwise patentable. They accordingly request a favorable early action. The undersigned would be pleased to speak with the Examiner at any time, and at the Examiner's convenience, about these matters.

Respectfully submitted,

James L. Ewing, IV, Reg. No. 30,630

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KILPATRICK STOCKTON LLP
1100 Peachtree Street, Suite 2800
Atlanta, Georgia 30309
(404-815-6494